

REMARKS/ARGUMENTS

Claims 9-12, 15, 17-19, and 21-23 are allowed, and Claims 4 and 8 are indicated to be patentable in subject matter.

Claims 1-3 were rejected as being unpatentable over U.S. Patent No. 4,472,107 to Chang et al. in view of U.S. Patent No. 6,190,123 to Wunderwald et al. Claims 5-7 and 13 were rejected as unpatentable over Chang and Wunderwald and further in view of U.S. Patent No. 5,816,784 to Postuchow.

Applicant appreciates the allowance and indication of allowability of the majority of the claims in this application. In view of the above amendments and following remarks, it is submitted that all pending claims are allowable.

Rejection of Claims 1-3 Based on Chang and Wunderwald

Claim 1 is directed to a compressor that compresses a mixture of air and fuel fed into the compressor. As will be appreciated, when air and fuel are compressed in the compressor, unless positive steps are taken to prevent it, some fuel will leak into the bearing area of the compressor and from there can escape into the atmosphere. This is highly undesirable, given the stringent requirements often imposed on turbogenerators in terms of emissions of unburned hydrocarbons and the like. The invention of Claim 1 has as its object to prevent fuel from leaking into the bearing area. Toward this end, a sealing arrangement is provided to prevent fuel from leaking via the leakage pathway into the bearing casing and thereby escaping into the atmosphere. The sealing arrangement comprises a hydraulic resistance element disposed between a surface of the compressor wheel and a fixed wall of the compressor housing, and a pressurized air supply duct leading through the compressor housing into the leakage pathway at a location between the bearing casing and the hydraulic resistance element. The leakage pathway includes a portion that extends from the hydraulic resistance element to the bearing casing and that is free of any further hydraulic resistance elements.

The sealing arrangement includes a source of pressurized air that is free of fuel and that has a pressure exceeding that in the main gas flow path. The source is arranged to feed the pressurized fuel-free air through the pressurized air supply duct into the compressor leakage pathway such that the pressurized fuel-free air prevents fuel from flowing from the main gas flow path past the hydraulic resistance element and into the bearing casing.

None of the cited references discloses or suggests the compressor of Claim 1, for various reasons. First, neither Chang nor Wunderwald teaches or suggests a compressor that includes a fuel supply duct arranged for supplying fuel into the inlet duct of the compressor such that the compressor compresses a mixture of air and fuel. The Office Action indicated this feature (in original Claim 4) was not suggested by the prior art. Thus, Claim 1 is patentable for this reason.

Second, Chang and Wunderwald would not have suggested the claimed feature of “a source of pressurized air that is free of fuel and that has a pressure exceeding that in the main gas flow path, said source being arranged to feed the pressurized fuel-free air through the pressurized air supply duct into the leakage pathway such that the pressurized fuel-free air prevents fuel from flowing from the main gas flow path past the hydraulic resistance element and into the bearing casing”. The Office Action acknowledged that Chang does not disclose this feature, but asserted that Wunderwald discloses it, and that it would have been obvious to modify Chang to include it.

Applicant respectfully disagrees that Wunderwald would have suggested such a modification of Chang. In Chang’s compressor, there is a pressure-balancing chamber **52** behind the compressor wheel that is in fluid communication with the leakage pathway **45** via a hydraulic seal. The pressure in this balancing chamber is controlled so that the net axial force on the thrust bearing for the turbocharger is always essentially zero. More particularly, the pressure-balancing chamber **52** is in fluid communication with a conduit **54** in the region of the hydraulic seal, and with another conduit **53**. The conduit **53** is connected via a controllable valve **55** to a conduit **58** that connects with the compressor discharge volute **39** (i.e., a source of high pressure air). The conduits **53** and **54** also merge at a point below the valve **55** and are connected via additional valves **56** and **57** to a plurality of pressure sinks **160, 161, 162** that have relatively low pressures

below the pressure of the working fluid discharged from the compressor wheel (one sink venting to atmosphere, for example, and one sink at a pressure not exceeding the low pressure of the working fluid). Depending on how these various valves are controlled at different operating conditions, the pressure supplied to the balancing chamber **52** (and thus to the leakage pathway **45**) can vary. In some operating conditions, the valve **56** is opened so as to expose the balancing chamber **52** to the low-pressure sinks (col. 5, lines 55-68). In other conditions, the valve **55** is opened to expose the balancing chamber to the high-pressure discharge volute **39** (col. 6, lines 1-13).

In view of Chang's specific objective of controlling axial load via the balancing chamber, a person of ordinary skill in the art would never have considered it desirable (and indeed it may not even be feasible) to modify Chang's turbocharger to add the cooling system of Wunderwald. Supplying air into the leakage pathway to cool the back side of the compressor wheel (as taught by Wunderwald) in Chang's system would very likely interfere with the desired control of the pressure in the balancing chamber **52**.

In short, Wunderwald and Chang have two very different objectives in their respective systems, and it is not clear that it would even be possible to combine both approaches in a single system and preserve the desired advantages of both simultaneously. For these additional reasons, it is submitted that Claim 1 is patentable over the cited references. Claims 2 and 3 are patentable for at least the same reasons.

Rejection of Claims 5-7 and 13 Based on Chang and Wunderwald and Postuchow

Claim 5 shares the feature with Claim 1 of a fuel supply duct arranged for supplying fuel into the inlet duct of the compressor such that the compressor compresses a mixture of air and fuel. The Office Action indicated this feature (in original Claim 8) was not suggested by the prior art. Thus, Claim 5 is patentable for this reason.

Additionally, it is submitted for the reasons noted above that Chang and Wunderwald would not have been combined. Moreover, Postuchow does not cure the deficiencies of Chang

and Wunderwald, nor would Postuchow have suggested modifying Chang's compressor to include auxiliary blades as claimed. The passage of Postuchow at col. 1, lines 35-39 is discussing a prior art U.S. Patent No. 4,915,579 to Whittier et al., rather than Postuchow's compressor. Postuchow does not disclose any auxiliary blades for discouraging leakage flow along the back side of the compressor wheel. Postuchow actually discloses a secondary impeller *E'* that has vanes *V* that urge fluid radially *inwardly* into a reservoir *R* (col. 3, lines 32-39). In contrast, the auxiliary blades of Claim 5 draw air radially outwardly and inject it into the main gas flow path.

For these reasons, the rejection of Claim 5 under § 103 is erroneous and should be withdrawn. Claims 6 and 7 are patentable for at least the same reasons.

Claim 13 includes auxiliary blades similar to Claim 5, as well as the pressurized air supply duct and fuel-free air supply at a higher pressure than the main gas flow path, similar to Claim 1. The foregoing remarks should make it clear that Chang, Wunderwald, and Postuchow do not teach or suggest a compressor having these features.

Conclusion

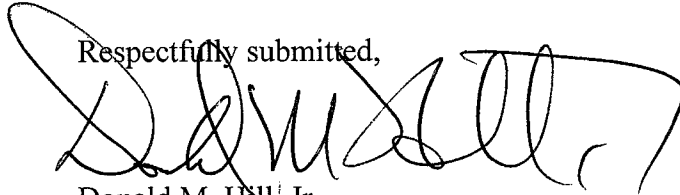
Based on the above amendments and remarks, it is respectfully submitted that all pending claims are patentable and the application is in condition for allowance.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required

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therefor (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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